

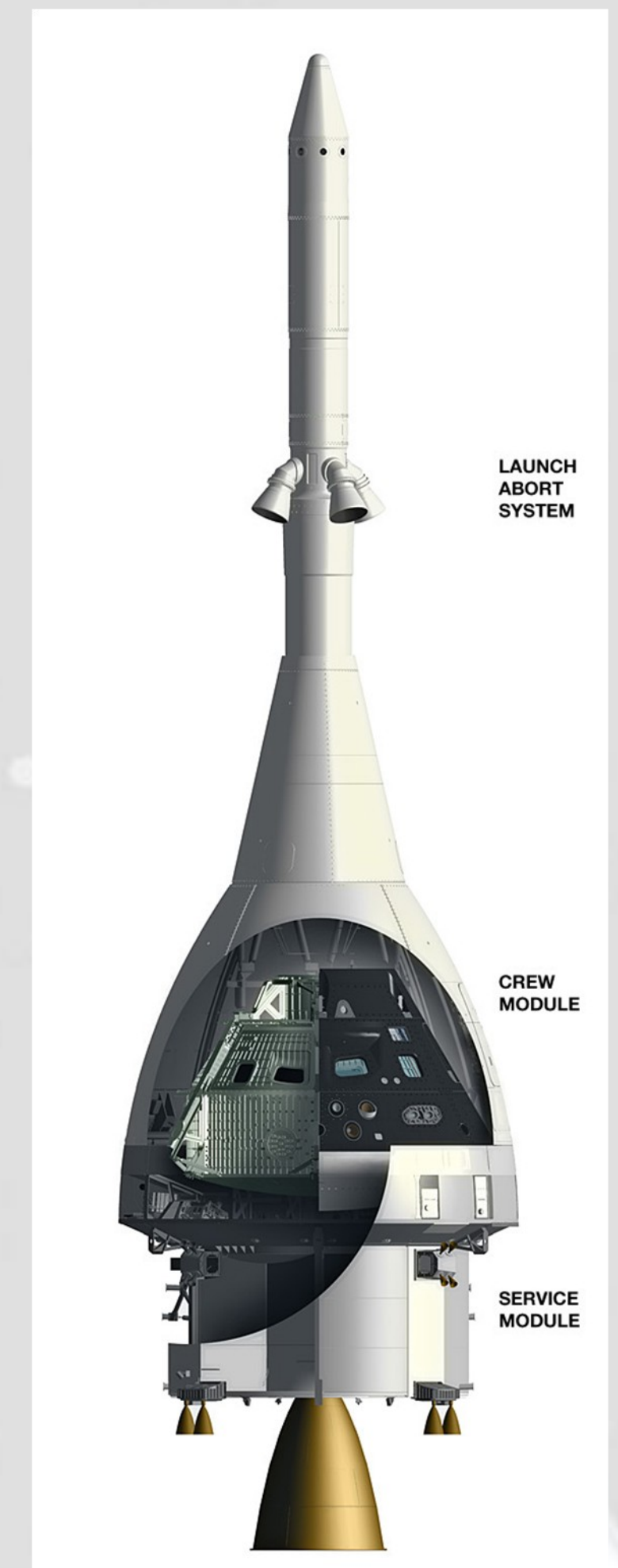
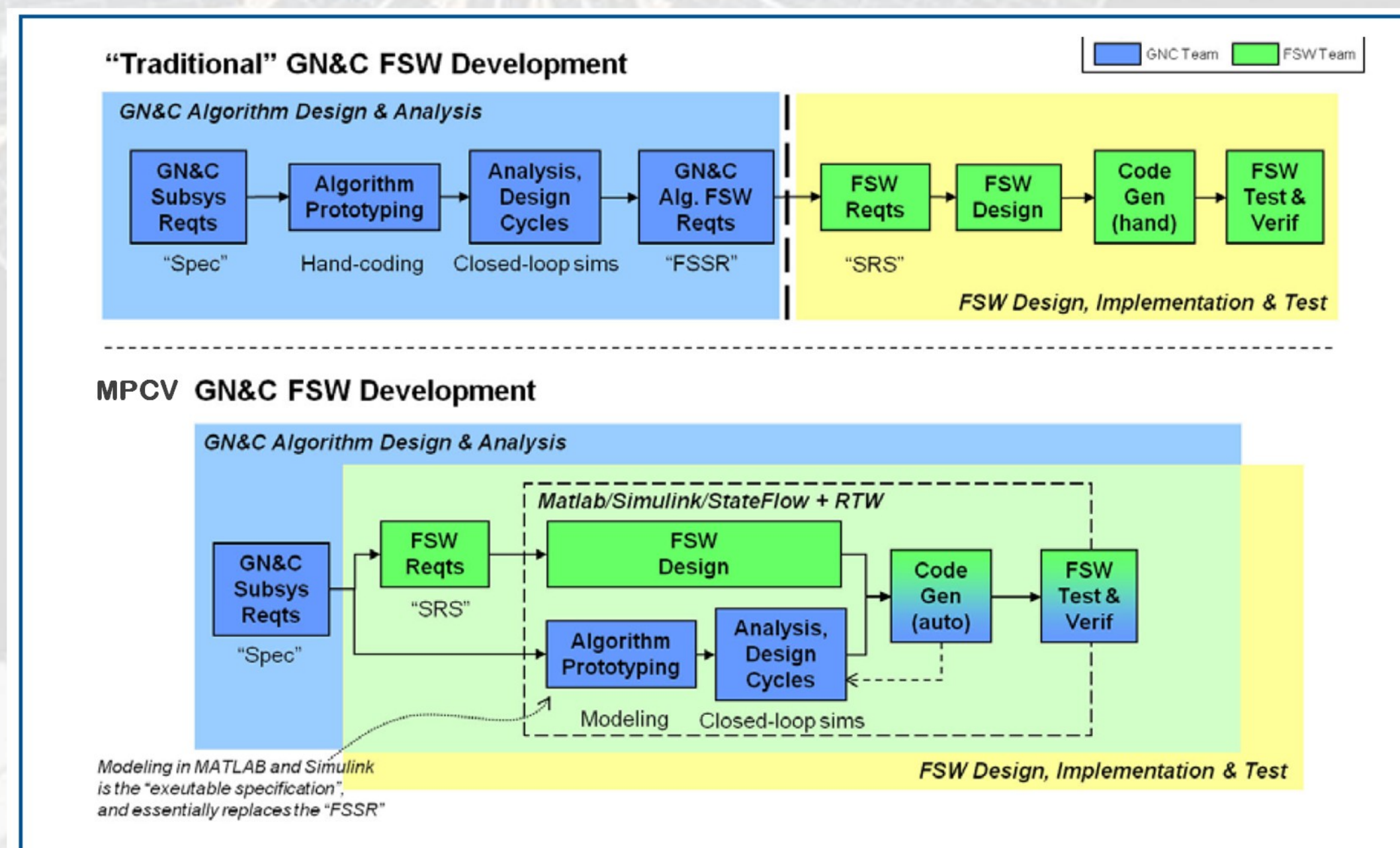
IV&V of MPCV Project Model-Based Design Software

The Multi-Purpose Crew Vehicle (MPCV) Project is following a model-based design (MBD) approach for the development of the GN&C flight software.

- Designed in the Simulink® modeling environment.
- C/C++ code is auto-generated from the models and integrated into FSW build.
- Approach merges design and implementation phases
- Init testing also done in this model environment by the Project.

Traditional FSW development flows from requirements to design to implementation:

For MPCV GN&C FSW there is more direct involvement of SMEs and software developers in design and implementation.



Technical goals, from IV&V Technical Framework 09-1 Rev N:

"To ensure that ... "

"5.0 ... the design is a correct, accurate, and complete transformation of the software requirements that will meet the operational need under nominal and off-nominal conditions and that no unintended features are introduced."

"5.1 ... requirements are represented in the appropriate elements of the design ..."

"5.3 ... the design satisfies the needs of the system, and that it is a feasible solution..."

"5.5 ... complex algorithms have been correctly derived, provide the needed behavior ... "

Challenge:

- Model based FSW is the primary IV&V analysis target, not the auto-generated C/C++ code.
- IV&V focus of this analysis is on design rather than final source code implementation.
- Scoped to GNC for autonomous operation in uncrewed flight test OFT-1 scheduled for July 2013.

Approach:

- Inspection of model
 - Data type/definition tracing
 - Event triggers
- Trace Behavior to
 - GNC Data books
 - Mission Event Sequences
- Demonstration through model execution
 - Test algorithm behavior
 - Test control logic
 - Requires identification and assignment of inputs
 - Off-nominal conditions and data inputs

